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Risk factors for antibiotic resistant bacterial colonisation in European Neonatal Units – results of the NeoIPC feasibility study

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Disclosures

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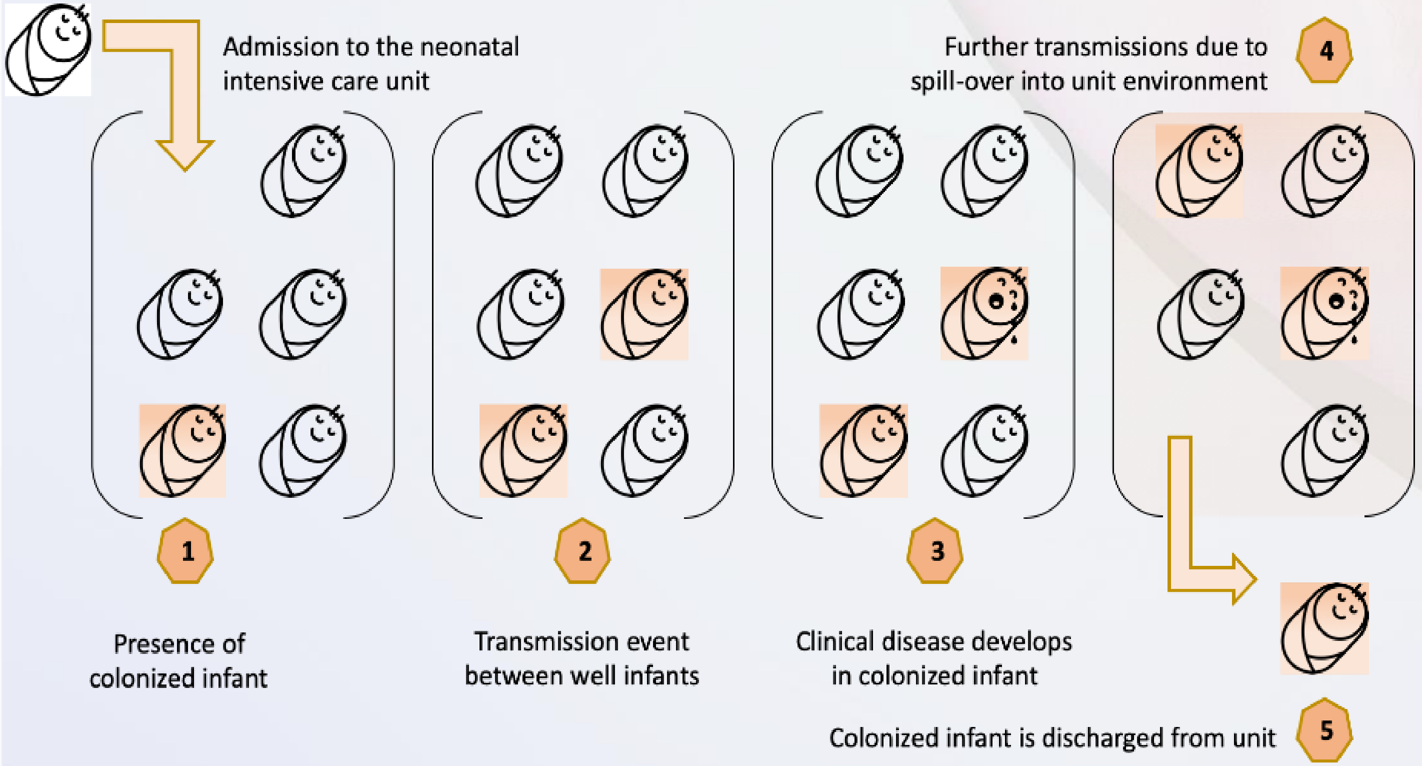
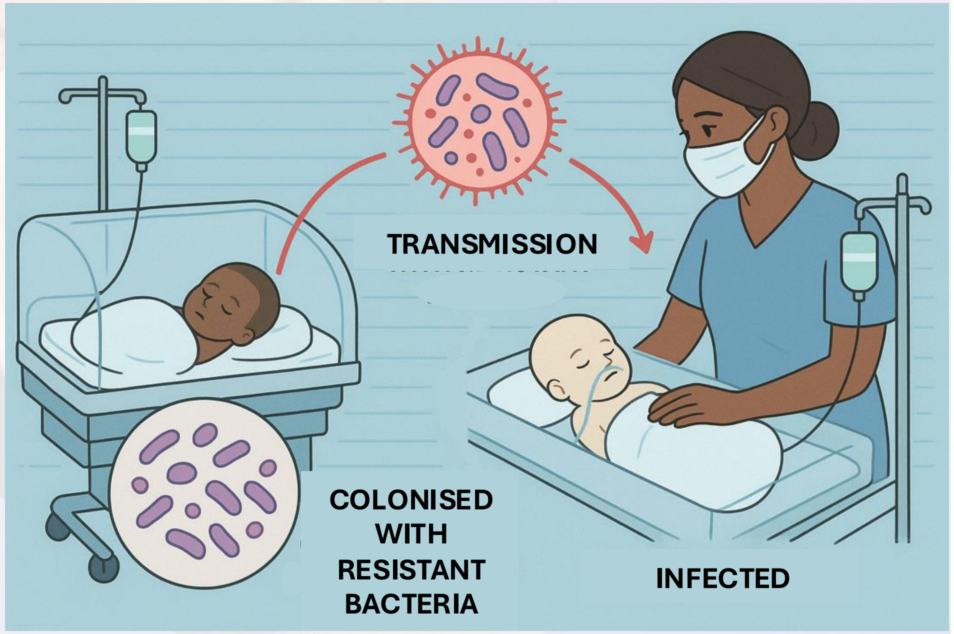
Background

NICU = hotspot for **IPC**





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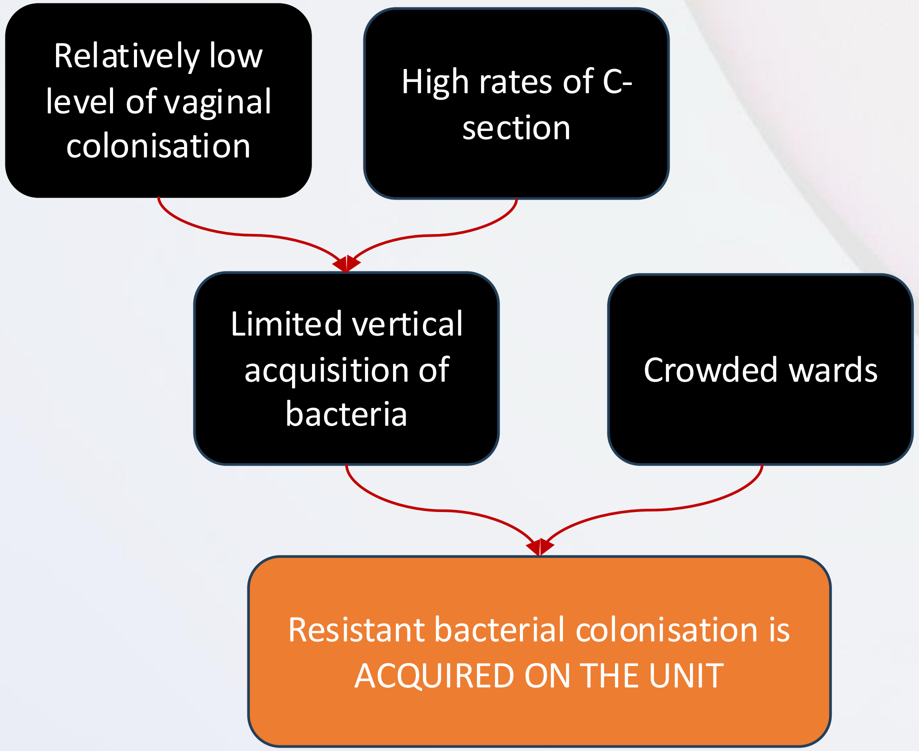


IPC interventions:

1) Reduce risk of infection (direct effects, e.g. CVC care bundles)
2) Reduce transmission and colonisation (direct AND indirect effects)

Indirect effects require unit/cluster level investigations/actions

Objective of NeoIPC feasibility study

- Establishing the contribution of **unit-level** and **individual-level risk factors** for **gut resistant bacterial colonisation** for infants managed in European NICUs.

- Establishing a suitable design for a **NICU-based IPC randomised controlled trial**.

NeoIPC

Design and setting

- Observational cross-sectional colonisation assessment
- **4 cross-sectional surveys** over a four-week period (Jan22 – Jun24)
- **24 neonatal units** in tertiary hospitals (8 EU countries)

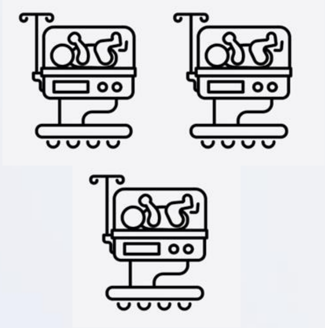
- **All infants** eligible, no exclusion criteria
- **Stool samples** collected at each survey and analysed by **RT-qPCR** for the presence of:
    - **ESBL** genes
    - **Carbapenemase** genes
    - **Vancomycin resistance** genes

- Main outcome: antibiotic-resistant gene carriage

defined as the detection of at least one of the relevant target genes in stool

Analysis and exposures

Model investigating **risk factors associated with the odds of infant colonisation** accounting for neonatal unit of admission and infants contributing to multiple surveys



Unit-level factors:
- colonisation pressure (proportion of infants colonised on the unit)
- proportion of high-risk infants (born <32 weeks' gestational age) on the unit.

Infant-level factors:

- gestational age
- length of stay on the unit prior to survey (weeks)
- previous antibiotic exposure in the 14 days before survey
- presence of central lines
- previous surgery
- receipt of TPN

in the 24 hours prior to the survey.

Results (I)

Main analysis population: 752 infants from **1338 infant-survey observations** (inborn and hospitalised from birth with complete clinical observations and available stool samples across all four surveys).

[1]*n (%); Median (Q1 - Q3)*		**Stool resistant bacterial colonisation status**	
Characteristic	Overall N = 1,338[1]	Not colonised N = 1,049[1]	Colonised N = 289[1]
Gestational age (weeks)	32.0 (28.0 - 36.0)	32.0 (28.0 - 36.0)	32.0 (30.0 - 37.0)
Birthweight (grams)	1,690 (995 - 2,600)	1,665 (950 - 2,614)	1,770 (1,210 - 2,540)
Length of stay on NICU at survey (weeks)	2.1 (0.9 - 4.9)	2.1 (0.7 - 4.6)	2.4 (1.0 - 5.7)
Surgery prior to survey	272 (20%)	220 (21%)	52 (18%)
Presence of central line within 24 hours	265 (20%)	230 (22%)	35 (12%)
Receipt of TPN in prior 24 hours	262 (20%)	222 (21%)	40 (14%)
Antibiotic exposure within 14 days	731 (55%)	581 (55%)	150 (52%)
Proportion of other infants colonised on unit	0.1 (0.0 - 0.3)	0.1 (0.0 - 0.3)	0.4 (0.2 - 0.7)
Proportion of infants classified as high risk (<32 weeks gestation)	0.4 (0.4 - 0.6)	0.5 (0.4 - 0.6)	0.4 (0.3 - 0.5)
Bed occupancy proportion	0.7 (0.5 - 0.8)	0.7 (0.6 - 0.8)	0.6 (0.5 - 0.8)

Results (II)

22% (289/1338) of stool samples were **positive for any antibiotic-resistance gene** (ARG)

Most common:

- ESBL genes (67%, 194/1338)
- Carbapenemase genes (33%, 96/1338)
- Vancomycin-resistance genes (24%, 69/1338).

Co-colonisation of genes uncommon (3%-11%)

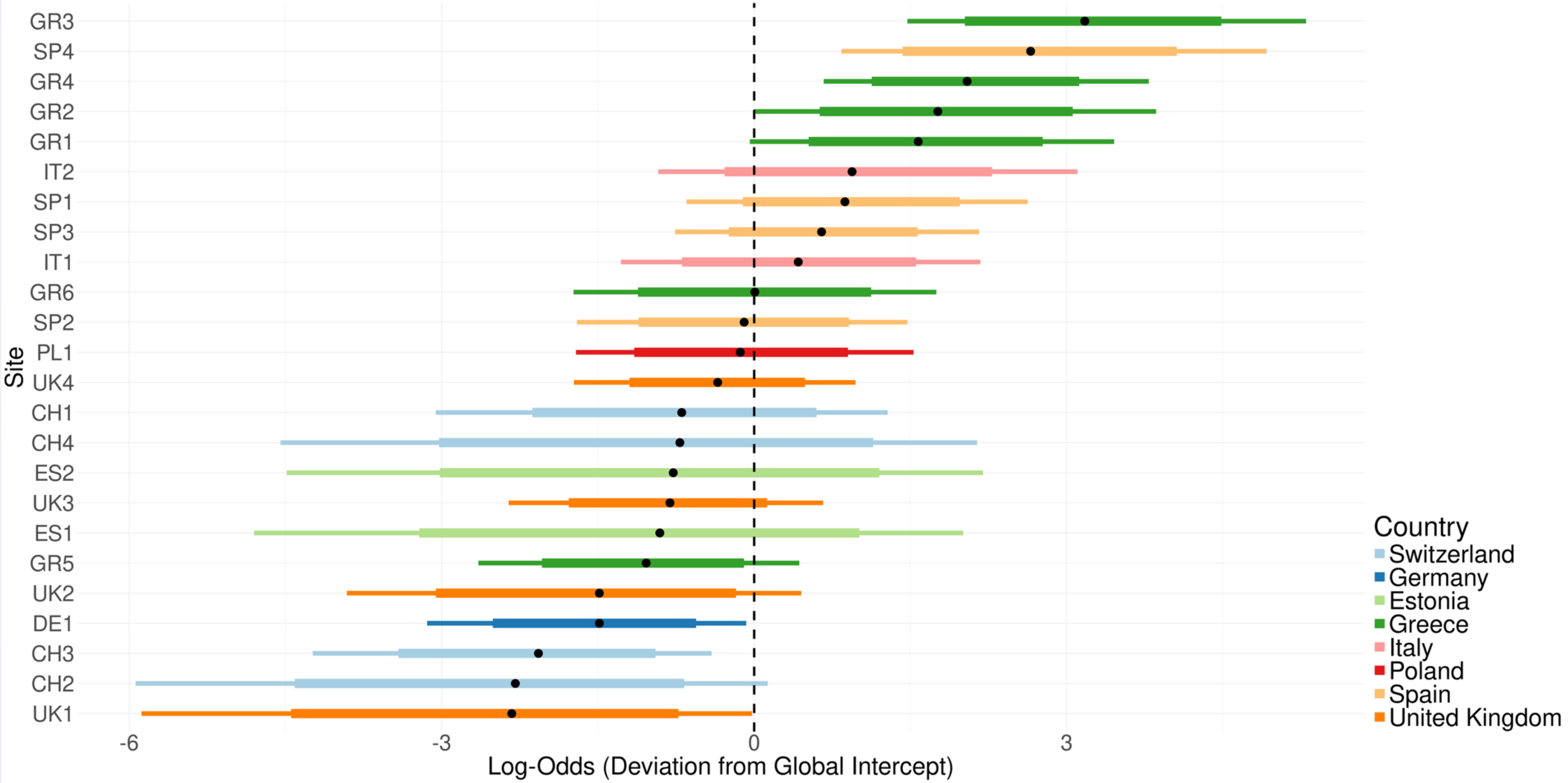
*943 infants contributing to 1847 infant-survey observations across the four PPS surveys.

Results (III)

High levels of :

- intra-site variation (SD: 1.9, 95%CrI: 1.04, 3.14)
- intra-infant variation (SD: 2.42, 95%CrI: 1.78, 3.2)

in infant resistant bacterial colonisation.

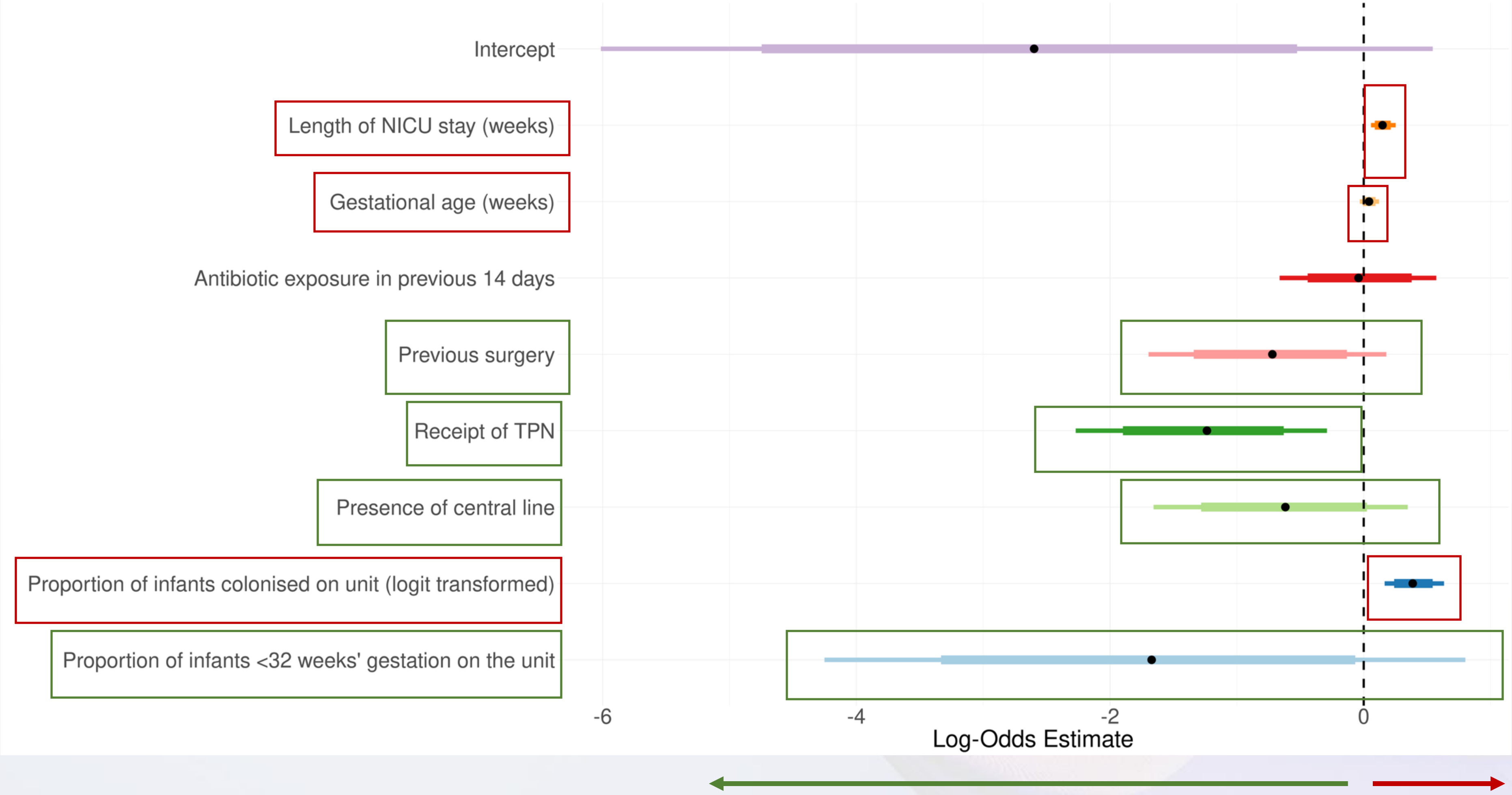


- Southern European countries had higher log-odds of colonisation

Results (IV)

Infant stool colonisation model: effects from primary analysis on log-odds scale.

Point estimates and 80% credible interval (thicker band) and 95% credible interval (thinner band) of posterior draws of model fit for fixed effect parameters.



Interpretation

- **Colonisation pressure** was associated with individual risk of colonisation – (likely reflects transmission)
- **Length of stay** prior to assessment: important infant-level risk factor

- **% of high-risk infants on the unit**, receipt of **TPN** and presence of **CVC** may be negatively associated with colonisation: indicative of how effectively IPC is applied on the unit? / proxy for strict direct IPC measures?
- No effect for antibiotic exposure over previous 14 days

- All infants on the unit included (and low-risk infants were colonised, thus contributing to transmission/colonisation pressure)
- Infection prevention and control (IPC) interventions should target all patients on the unit.
- Focus on unit-level IPC interventions which target both direct and indirect effects of colonisation.

Thank you!

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